HA178L00 Series

3-terminal Fixed Voltage Regulators

HITACHI

ADE-204-051 (Z)
Rev. 0
Dec. 2000

Description

The HA178L00 series three-terminal fixed output voltage regulators. Can be used not only as stabilized power sources, but also as Zener diodes because of their small outline package.

Features

- Maximum output current: 150 mA (Tj= 25°C)
- Large maximum power dissipation: 800 mW
- Overcurrent protection
- Temperature protection circuit

Ordering Information

Application	Standard Output Voltage Tolerance ±8%	A Version Output Voltage Tolerance ±5%
Industrial use	HA178L00P	HA178L00PA
Commercial use	HA178L00	HA178L00A
		HA178L00UA

Hitachi semiconductor

Output Voltage and Type

HA178L00PA • HA178L00P • HA178L00A • HA178L00

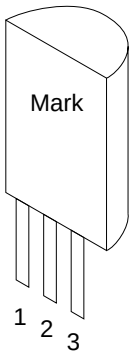
Output Voltage (V)	Type	Package
2.5	HA178L02	TO-92M
5	HA178L05	
5.6	HA178L56	
6	HA178L06	
8	HA178L08	
9	HA178L09	
10	HA178L10	
12	HA178L12	
15	HA178L15	

HA178L00UA

Output Voltage (V)	Type	Marking	Package
2.5	HA178L02UA	8A	UPAK
5	HA178L05UA	8B	
5.6	HA178L56UA	8C	
6	HA178L06UA	8D	
8	HA178L08UA	8E	
9	HA178L09UA	8F	
10	HA178L10UA	8G	
12	HA178L12UA	8H	
15	HA178L15UA	8J	

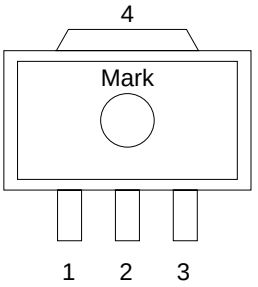
Pin Arrangement

• **TO-92M**



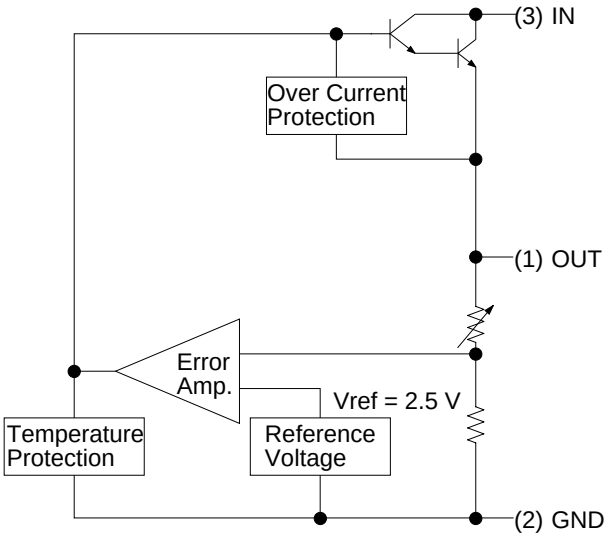
1. OUT
2. GND
3. IN

• **UPAK**

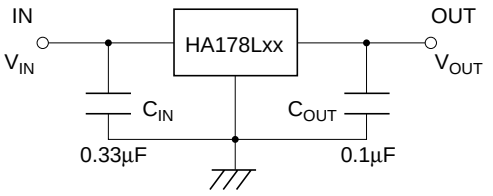


1. OUT
2. GND
3. IN
4. GND

Block Diagram

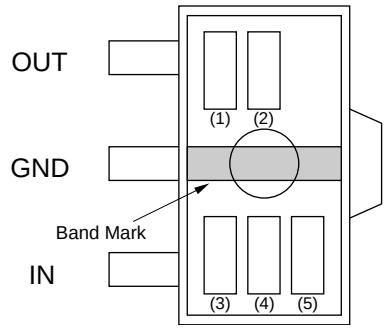


Standard Circuit



UPAK Product (HA178L00UA) Mark Patterns

The mark patterns shown below are used. on UPAK products, as the package is small. Note that the product code and mark pattern are different.The pattern is laser-printed.



Notes: 1. Boxes (1) to (5) in the figures show the position of the letters or numerals, and are not actually marked on the package.

2. (1) and (2) show the product-specific mark pattern. (see table 1)

Table 1

Output Voltage (V)	Product No.	Mark Pattern (2 digit)
2.5	HA178L02UA	8A
5	HA178L05UA	8B
5.6	HA178L56UA	8C
6	HA178L06UA	8D
8	HA178L08UA	8E
9	HA178L09UA	8F
10	HA178L10UA	8G
12	HA178L12UA	8H
15	HA178L15UA	8J

3. (3) shows the production year code (the last digit of the year).
4. (4) shows the production month code (see table 2).

Table 2

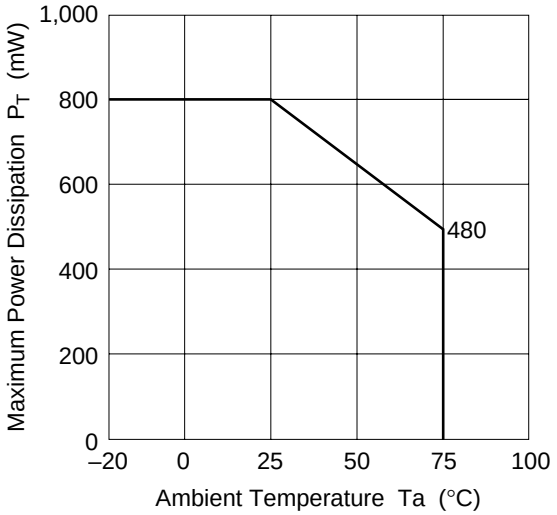
Production Month	1	2	3	4	5	6	7	8	9	10	11	12
Marked Code	A	B	C	D	E	F	G	H	J	K	L	M

5. (5) shows the production week code.

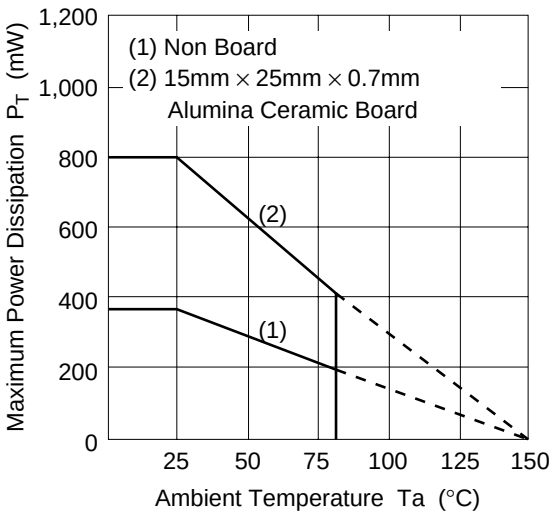
Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Input voltage	V_{IN}	35	V	
Power dissipation	P_T	800	mW	TO-92M*[1]
		800	mW	UPAK*[2]
Operating ambient temperature	Topr	–20 to +75	°C	TO-92M
		–20 to +85	°C	UPAK
Storage temperature	Tstg	–55 to +150	°C	

Note: 1. Ta ≤ 25°C, If Ta >25°C, derate by 6.4 mW/°C (See figure A)
2. 15mm × 25mm × 0.7 mm alumina ceramic board, Ta ≤ 25°C (See figure B)



A



B

HA178L02 Electrical Characteristics

(V_{IN} = 10 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF)

		HA178L02P HA178L02			HA178L02PA HA178L02A HA178L02UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	2.32	2.48	2.64	2.38	2.48	2.58	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	35	125	—	35	95	mV	Tj = 25°C, 7 V ≤ V_{IN} ≤ 20 V
		—	30	100	—	30	75		8 V ≤ V_{IN} ≤ 20 V
Load regulation	δV_{OLOAD}	—	14	—	—	14	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	9.5	50	—	9.5	50		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	4.5	25	—	4.5	25		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	2.28	—	2.68	2.35	—	2.61	V	7 V ≤ V_{IN} ≤ 20 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		2.28	—	2.68	2.35	—	2.61		V_{IN} = 9 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.0	6.0	—	3.0	6.0	mA	Tj= 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj= 25°C, 8 V ≤ V_{IN} ≤ 20 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	60	—	—	60	—	dB	f = 120 Hz, 8.0 V ≤ V_{IN} < 18 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	+0.2	—	—	+0.2	—	mV/°C	I_{OUT} = 5 mA

HA178L05 Electrical Characteristics

(V_{IN} = 10 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L05P HA178L05			HA178L05PA HA178L05A HA178L05UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	4.68	5.0	5.32	4.8	5.0	5.2	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	55	200	—	55	150	mV	Tj = 25°C, 7 V ≤ V_{IN} ≤ 20 V
		—	45	150	—	45	100		8 V ≤ V_{IN} ≤ 20 V
Load regulation	δV_{OLOAD}	—	16	—	—	16	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	11	60	—	11	60		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	5.0	30	—	5.0	30		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	4.6	—	5.4	4.75	—	5.25	V	7 V ≤ V_{IN} ≤ 20 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		4.6	—	5.4	4.75	—	5.25		V_{IN} = 10 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.0	6.0	—	3.0	6.0	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 8.0 V ≤ V_{IN} ≤ 20 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	58	—	—	58	—	dB	f = 120 Hz, 8.0 V ≤ V_{IN} < 18 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	+0.1	—	—	+0.1	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L56 Electrical Characteristics

(V_{IN} = 11 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L56P HA178L56			HA178L56PA HA178L56A HA178L56UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	5.24	5.6	5.96	5.38	5.6	5.82	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	50	200	—	50	150	mV	Tj = 25°C, 7.6 V ≤ V_{IN} ≤ 21 V
		—	45	150	—	45	100		8.5 V ≤ V_{IN} ≤ 21 V
Load regulation	δV_{OLOAD}	—	17	—	—	17	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	11	60	—	11	60		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	5.0	30	—	5.0	30		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	5.16	—	6.04	5.32	—	5.88	V	7.6 V ≤ V_{IN} ≤ 21 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		5.16	—	6.04	5.32	—	5.88		V_{IN} = 11 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.0	6.0	—	3.0	6.0	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 8.5 V ≤ V_{IN} ≤ 2.0 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	58	—	—	58	—	dB	f = 120 Hz, 8.5 V ≤ V_{IN} < 18.5 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	+0.1	—	—	+0.1	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L06 Electrical Characteristics

(V_{IN} = 11 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L06P HA178L06			HA178L06PA HA178L06A HA178L06UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	5.61	6.0	6.39	5.76	6.0	6.24	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	50	200	—	50	150	mV	Tj = 25°C, 8.1 V ≤ V_{IN} ≤ 21 V
		—	45	150	—	45	110		9.0 V ≤ V_{IN} ≤ 21 V
Load regulation	δV_{OLOAD}	—	17.5	—	—	17.5	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	12	70	—	12	70		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	5.5	35	—	5.5	35		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	5.52	—	6.48	5.7	—	6.3	V	8.1 V ≤ V_{IN} ≤ 21 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		5.52	—	6.48	5.7	—	6.3		V_{IN} = 11 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.0	6.0	—	3.0	6.0	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 9.0 V ≤ V_{IN} ≤ 20 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	57	—	—	57	—	dB	f = 120 Hz, 9.0 V ≤ V_{IN} < 19 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	+0.1	—	—	+0.1	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L08 Electrical Characteristics

(V_{IN} = 14 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L08P HA178L08			HA178L08PA HA178L08A HA178L08UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	7.48	8.0	8.52	7.7	8.0	8.3	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	20	200	—	20	175	mV	Tj = 25°C, 10.5 V ≤ V_{IN} ≤ 23 V
		—	12	150	—	12	125		11 V ≤ V_{IN} ≤ 23 V
Load regulation	δV_{OLOAD}	—	22	—	—	22	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	15	80	—	15	80		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	7.0	40	—	7.0	40		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	7.36	—	8.64	7.6	—	8.4	V	10.5 V ≤ V_{IN} ≤ 23 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		7.36	—	8.64	7.6	—	8.4		V_{IN} = 14 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.0	6.5	—	3.0	6.5	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 11 V ≤ V_{IN} ≤ 23 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	55	—	—	55	—	dB	f = 120 Hz, 12 V ≤ V_{IN} < 23 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	–0.1	—	—	–0.1	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L09 Electrical Characteristics

(V_{IN} = 15 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L09P HA178L09			HA178L09PA HA178L09A HA178L09UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	8.42	9.0	9.58	8.64	9.0	9.36	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	80	230	—	80	200	mV	Tj = 25°C, 11.4 V ≤ V_{IN} ≤ 24 V
		—	20	160	—	20	160		12 V ≤ V_{IN} ≤ 24 V
Load regulation	δV_{OLOAD}	—	24.5	—	—	24.5	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	17	90	—	17	90		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	8.0	45	—	8.0	45		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	8.28	—	9.72	8.55	—	9.45	V	11.4 V ≤ V_{IN} ≤ 24 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		8.28	—	9.72	8.55	—	9.45		V_{IN} = 15 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.1	6.5	—	3.1	6.5	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 12 V ≤ V_{IN} ≤ 24 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	55	—	—	55	—	dB	f = 120 Hz, 12 V ≤ V < 24 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	–0.15	—	—	–0.15	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L10 Electrical Characteristics

(V_{IN} = 16 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L10P HA178L10			HA178L10PA HA178L10A HA178L10UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	9.35	10	10.65	9.6	10	10.4	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	80	230	—	80	230	mV	Tj = 25°C, 12.5 V ≤ V_{IN} ≤ 25 V
		—	30	170	—	30	170		13 V ≤ V_{IN} ≤ 25 V
Load regulation	δV_{OLOAD}	—	26	—	—	26	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	18	90	—	18	90		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	8.5	45	—	8.5	45		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	9.2	—	10.8	9.5	—	10.5	V	12.5 V ≤ V_{IN} ≤ 25 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		9.2	—	10.8	9.5	—	10.5		V_{IN} = 16 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.1	6.5	—	3.1	6.5	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 13 V ≤ V_{IN} ≤ 25 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	54	—	—	54	—	dB	f = 120 Hz, 13 V ≤ V_{IN} < 24 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	–0.2	—	—	–0.2	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

HA178L12 Electrical Characteristics

(V_{IN} = 19 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

		HA178L12P HA178L12			HA178L12PA HA178L12A HA178L12UA				
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Output voltage	V_{OUT}	11.22	12	12.78	11.5	12	12.5	V	Tj = 25°C
Line regulation	δV_{OLINE}	—	120	250	—	120	250	mV	Tj = 25°C, 14.5 V ≤ V_{IN} ≤ 27 V
		—	100	200	—	100	200		16 V ≤ V_{IN} ≤ 27 V
Load regulation	δV_{OLOAD}	—	28.5	—	—	28.5	—	mV	Tj = 25°C, 1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	20	100	—	20	100		1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	10	50	—	10	50		1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	11.04	—	12.96	11.4	—	12.6	V	14.5 V ≤ V_{IN} ≤ 27 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA
		11.04	—	12.96	11.4	—	12.6		V_{IN} = 19 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA
Quiescent current	I_Q	—	3.1	6.5	—	3.1	6.5	mA	Tj = 25°C
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C, 16 V ≤ V_{IN} ≤ 27 V
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	52	—	—	52	—	dB	f = 120 Hz, 15 V ≤ V_{IN} < 25 V, Tj = 25°C
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	–0.3	—	—	–0.3	—	mV/°C	I_{OUT} = 5 mA
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C

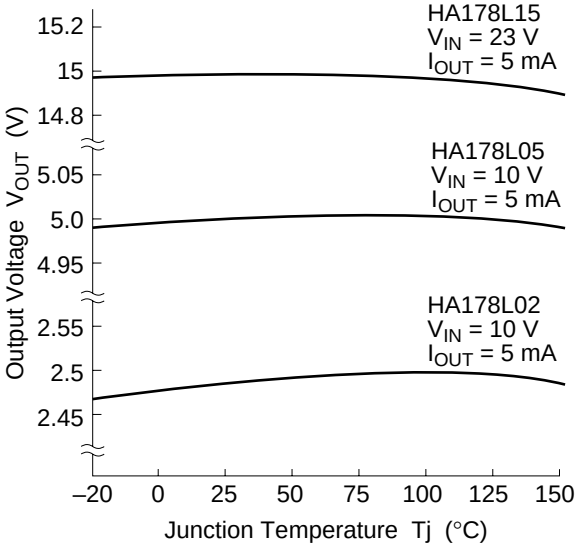
HA178L15 Electrical Characteristics

(V_{IN} = 23 V, I_{OUT} = 40 mA, 0°C Tj 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

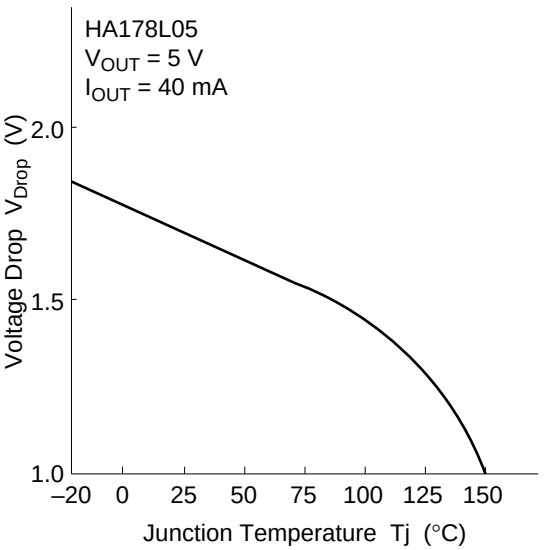
		HA178L15P HA178L15			HA178L15PA HA178L15A HA178L15UA					
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**	
Output voltage	V_{OUT}	14.03	15	15.97	14.4	15	15.6	V	Tj = 25°C	
Line regulation	δV_{OLINE}	—	130	300	—	130	300	mV	Tj = 25°C	17.5 V ≤ V_{IN} ≤ 30 V
		—	110	250	—	110	250			20 V ≤ V_{IN} ≤ 30 V
Load regulation	δV_{OLOAD}	—	36	—	—	36	—	mV	Tj = 25°C	1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	25	150	—	25	150			1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	12	75	—	12	75			1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	13.8	—	16.2	14.25	—	15.75	V	17.5 V ≤ V_{IN} ≤ 30 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	
		13.8	—	16.2	14.25	—	15.75		V_{IN} = 23 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA	
Quiescent current	I_Q	—	3.2	6.5	—	3.2	6.5	mA	Tj = 25°C	
Quiescent current change	δI_Q	—	—	1.5	—	—	1.5	mA	Tj = 25°C	20 V ≤ V_{IN} ≤ 30 V
		—	—	0.2	—	—	0.1			1.0 mA ≤ I_{OUT} ≤ 40 mA
Ripple rejection ratio	R_{REJ}	—	49	—	—	49	—	dB	f = 120 Hz, 18.5 V ≤ V_{IN} < 28.5 V, Tj = 25°C	
Temperature coefficient of output voltage	$\delta V_{OUT}/\delta Tj$	—	–0.5	—	—	–0.5	—	mV/°C	I_{OUT} = 5 mA	
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C	

Characteristic Curves

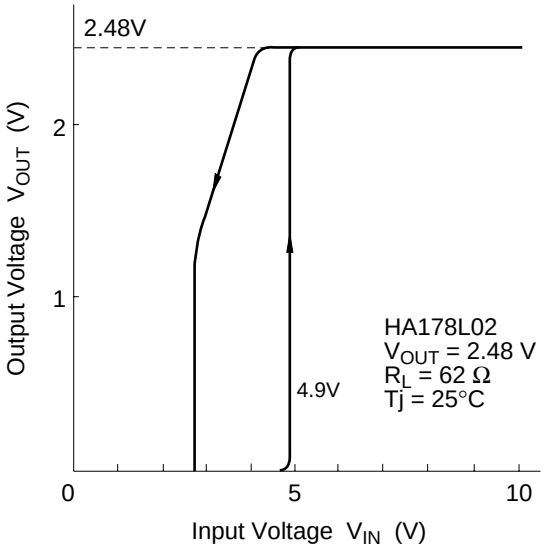
Output Voltage vs. Junction Temperature



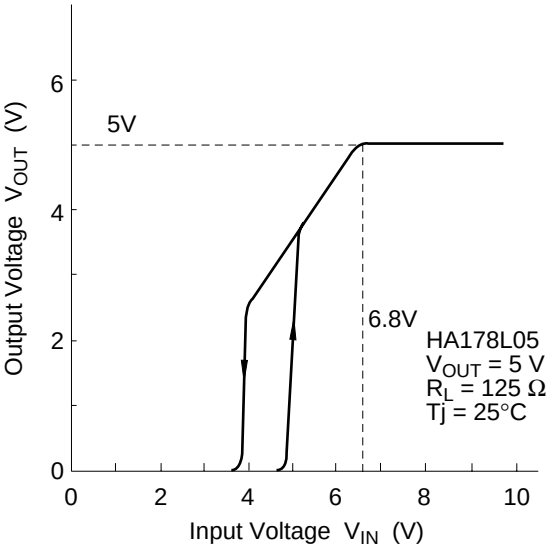
Voltage Drop vs. Junction Temperature



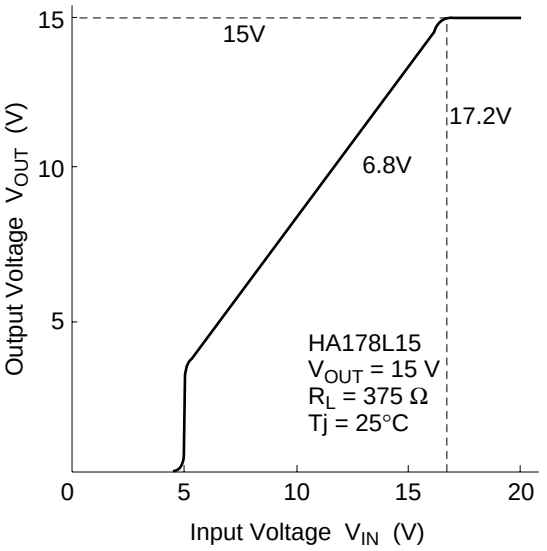
Output Voltage vs. Input Voltage (1)



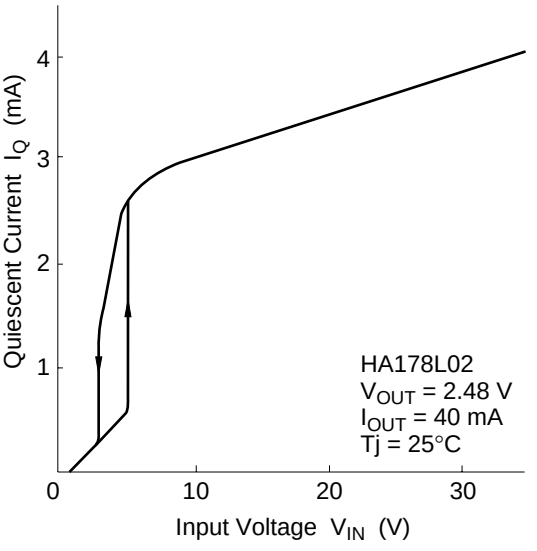
Output Voltage vs. Input Voltage (2)



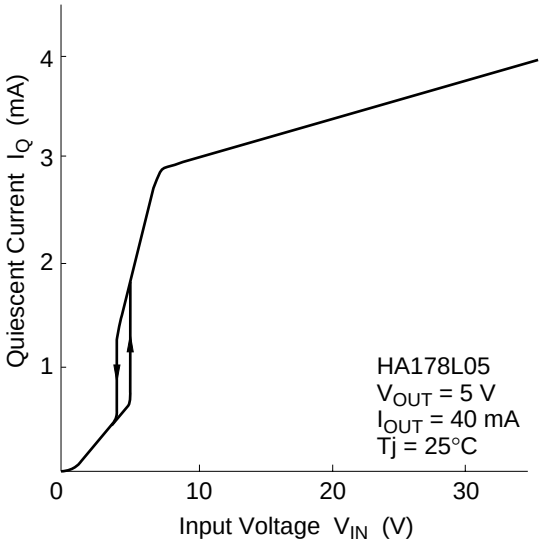
Output Voltage vs. Input Voltage (3)



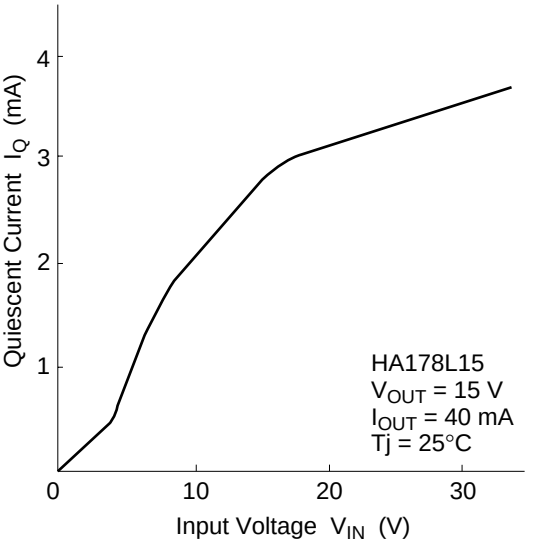
Quiescent Current vs. Input Voltage (1)



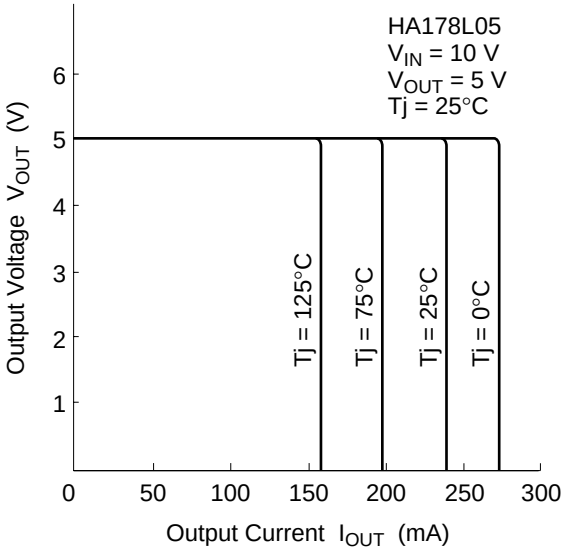
Quiescent Current vs. Input Voltage (2)



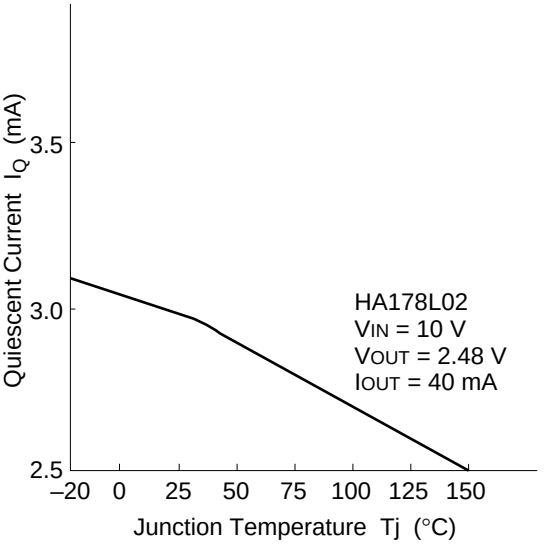
Quiescent Current vs. Input Voltage (3)



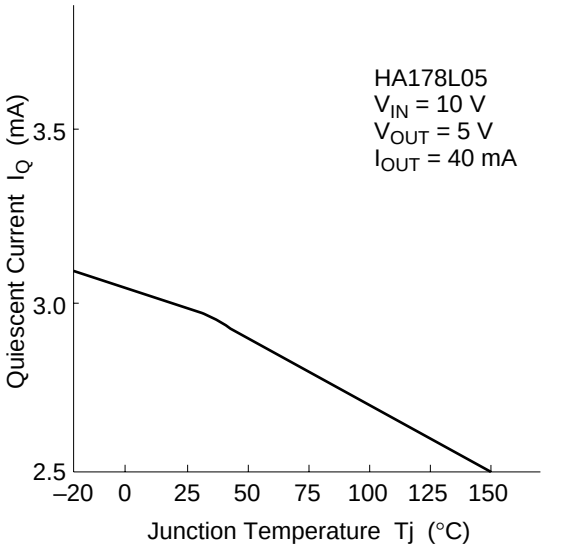
Output Voltage vs. Output Current



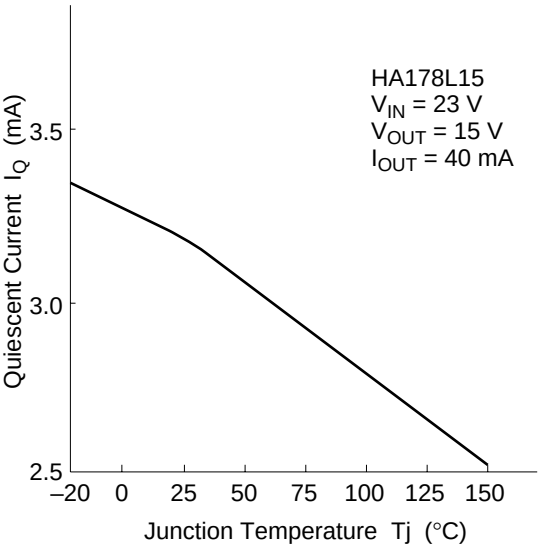
Quiescent Current vs. Junction Temperature (1)



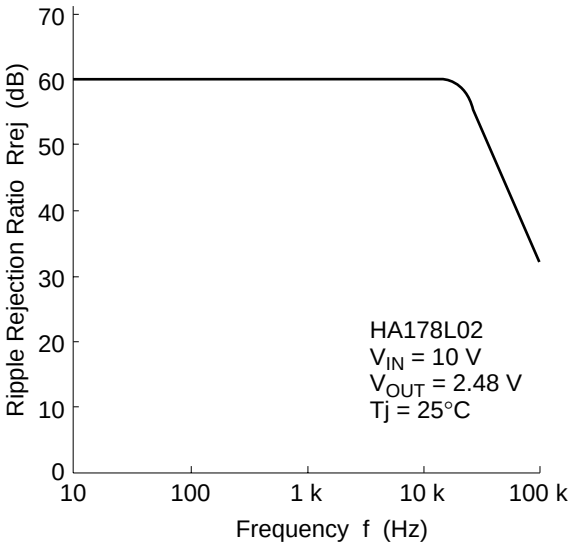
Quiescent Current vs. Junction Temperature (2)



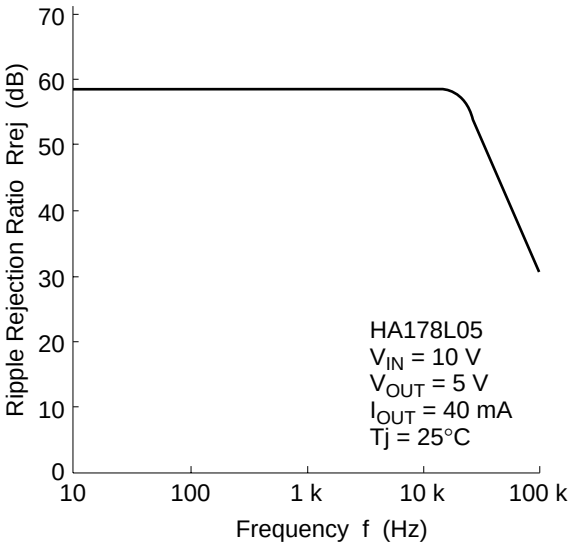
Quiescent Current vs. Junction Temperature (3)



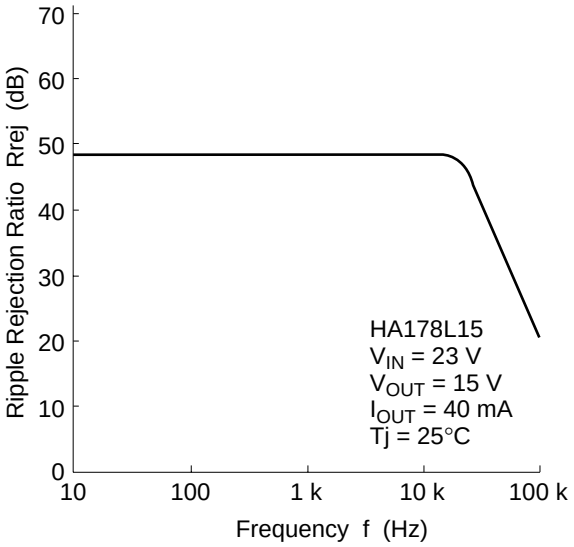
Ripple Rejection Ratio vs. Frequency (1)



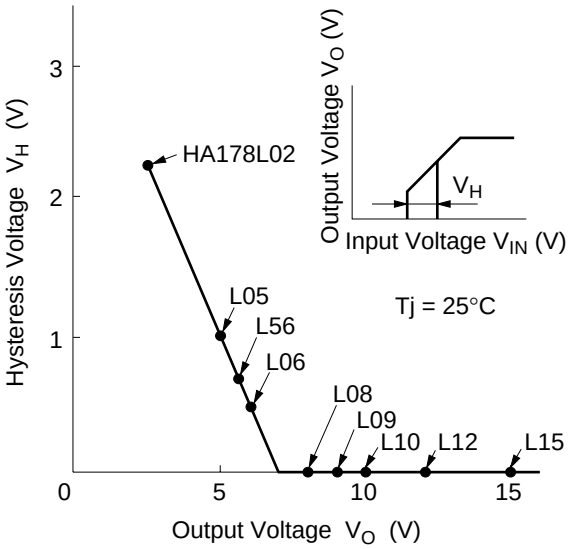
Ripple Rejection Ratio vs. Frequency (2)



Ripple Rejection Ratio vs. Frequency (3)

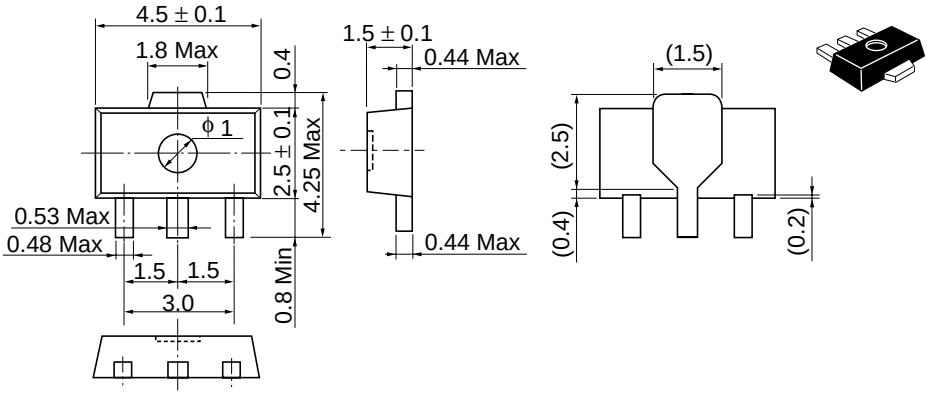


Hysteresis Voltage vs. Output Voltage



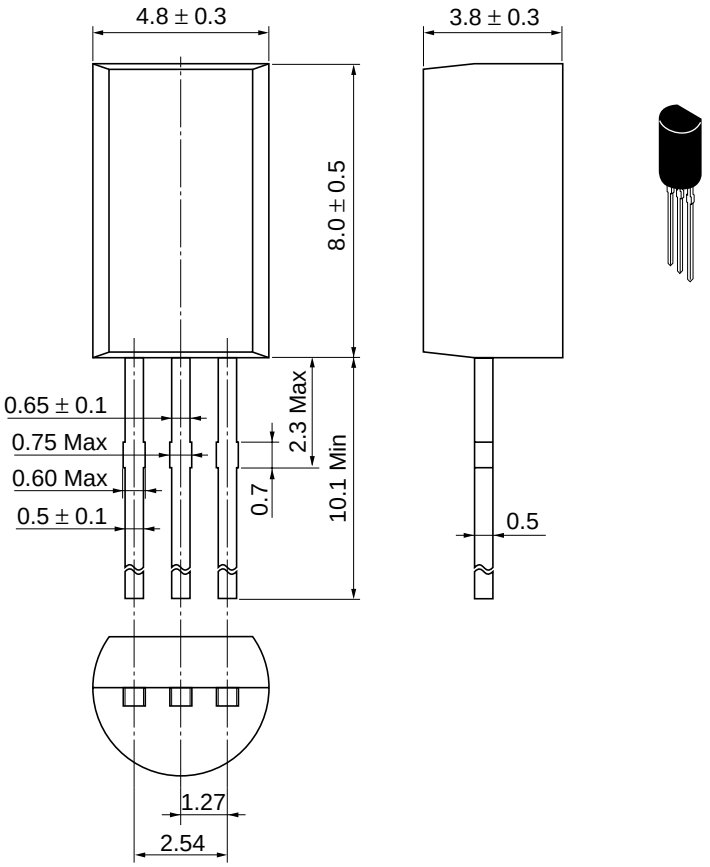
Package Dimensions

Unit: mm



Hitachi Code	UPAK
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.050 g

Unit: mm



Hitachi Code	TO-92 Mod
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.35 g

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